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(Ceylon)

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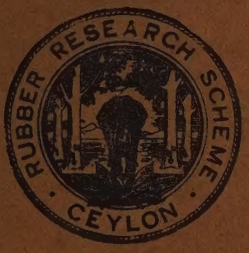

March, 1939.

Rubber Research Scheme (Ceylon)

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DARTONFIELD ESTATE—VISITORS' DAYS

The *second* and *fourth* Wednesdays in each month have been set aside as Visitors' Days at Dartonfield estate, and the services of technical officers will be available to visitors on those days. The estate superintendent will be available every Wednesday. Visitors are requested to arrive on the estate not later than 9.30 a.m.

While visitors will be welcomed at the Station on other days, any particular member of the staff may not be free to give them attention unless an appointment has been made.

Dartonfield estate is situated about $3\frac{1}{2}$ miles from the main Matugama-Agalawatta Road, the turn-off being near culvert No. 14/10. The distance from Colombo is approximately 47 miles.

PUBLICATIONS

Rubber Research Scheme publications comprising Annual Reports, Quarterly Circulars and occasional Bulletins and Leaflets, are available without charge to the Proprietors (resident in Ceylon) Superintendents and Local Agents of Rubber estates in Ceylon) over 10 acres in extent. Application for registration should be made to the Director, stating the name, acreage, and registered number of the estate(s) concerned.

IDENTIFICATION OF CLONES

The attention of Proprietors and Superintendents undertaking replanting or budgrafting programmes is drawn to Planting Manual No. 5 : " The History and Description of Clones of *Hevea Braziliensis*," issued by the Rubber Research Institute of Malaya, copies of which may be purchased on application to these Laboratories for Rs. 5.00 each (postage free). This publication give drawings and descriptive particulars of the more important clones, which should enable Superintendents to verify the authenticity of their material.

CEYLON CLONES VII. (1938).

C. E. FORD—*Geneticist*

Foreword

THIS article, presenting data for 1938, is the seventh of a series of annual reports on the test tapping of Ceylon clones. Previous reports were published as follows :—

Ceylon Clones,	I	Quarterly Circular, Vol. 10, Part 2, 1933.
Do.	II	Vol. 11, Part 1, 1934.
Do.	III	Vol. 12, Parts 1 & 2, 1935.
Do.	IV	Vol. 13, Parts 2 & 3, 1936.
Do.	V	Vol. 14, Parts 1 & 2, 1937.
Do.	VI	Vol. 15, Part 2, 1938.

Acknowledgment is made to those proprietors who have kindly given permission for the publication of the records of clones established from mother-trees on their properties.

Presentation of Results

As in previous years the principal information is given in two tables. Table I gives the average yield per tree per tapping for each year the trees have been tapped and the actual yield in lb. per tree during 1938, while in Table II the yields are calculated on the basis of 130 tappings on the half spiral alternate day system so as to make the results from the various clones as comparable as possible. The age is determined to the nearest half-year from the time of budding or planting to the middle of the tapping year.

In an attempt to compare the productive capacity of Ceylon and imported clones the yields of the best local clones and those of certain imported clones growing on the same estates are brought together in Table III. The results are discussed under the appropriate heading.

As a matter of general interest two further tables are included. These give the 1938 yields in pounds per tree of all the clones in test and commercial tapping at Nivitigalakele.

With the exception of the Hillcroft clones on Stennes Estate and of Tjirandji 1 at Millakande, all clones included in the tables have been tapped throughout their tapping history on the half spiral alternate day system. Yields are in every case determined only from those trees which were tapped continuously during the period to which the yields refer.

General Notes on Tables

Compared with last year, one clone has been omitted from Tables I and II on the grounds of insufficient yield increase, while three others are included for the first time. The yields of these clones are considered to be only of moderate promise, yet bear comparison with the yields of clones P.B.23 and 25 tapped in the same area. The yield of a group of unselected seedlings is again included for comparison. This is a plot of the original stocks which was left unbudded, and as budding was delayed they have an advantage of about two years.

Included in Table V, which gives semi-commercial tapping yields, are the records of a number of clones whose earlier yields were reported in this series, but which were omitted last year as not of marked promise. It was stated in that article that records were still being kept and that if any one of these clones should attain a very high yield at a later stage it could be reinstated. It will be noted that in none is the yield sufficient to warrant inclusion with the clones of Tables I and II.

With reference to Tables IV and V it should be noted that the comparison between clones is not a critical one since there is no replication and some clones are more favourably situated than others. This is particularly so in the case of clones included in Table IV which are planted in small monoclone blocks of 25 trees. When assessing the relative merits of these clones due allowance is made for differences of position and soil, but it is impossible to make any adjustment in a record such as Table IV, which should not be interpreted as a true order of merit.

Selection of Trees for Test Tapping

A full account of the ways in which trees were selected for test tapping was included in the report published last year.

The Hillcroft 55 trees on Stennes Estate and those of all clones at Nivitigalakele except Millakande 3/2 constitute random samples. Hillcroft 28 at Stennes and all clones at Millakande are probably rather above the average of the block in girth.

Notes on Individual Clones

Millakande 3/2.—Although the test tapped trees of this clone have shown a slight decrease in yield when compared with the 1937 figures, the yield of a block of 55 trees in semi-commercial tapping has increased from 16·4 grams in 1937 to 26·1 grams per tree per tapping in 1938. The yield of 41·5 grams per tapping at 8 years old is still highly satisfactory, though it should be repeated that the test tapped trees are the biggest of the block. Moreover, only 8 of the original 12 trees were tapped throughout 1938, 3 having developed Brown Bast and 1 having been blown down. Two of the Brown Bast trees were taken into tapping again in March, 1939.

On Millakande Estate the yield has again shown a moderate increase.

As mentioned in earlier reports the growth of this clone is very vigorous and the trees have an attractive straight trunk. Bark renewal is excellent. Five trees have developed Brown Bast out of a total of 67 trees in tapping at Nivitigalakele; at Millakande no cases have been reported. This difference is probably to be associated with the more vigorous growth and higher yield at Nivitigalakele. The trees have the same late dripping habit as Tjirandji 1 and if crop is not to be lost a second cup must be used.

Millakande 1/1.—The yield in 1938 was disappointing at Nivitigalakele. On Millakande the clone has shown a moderate increase.

Millakande 4/3.—After a very promising increase in 1937 the yield of this clone has declined slightly. This may be due in part to an increase in the height of the cut.

Hillcroft 28.—Owing to the incidence of Brown Bast this clone was tapped once in three days on Stennes Estate during 1936 and 1937. As from March, 1938, the tapping has reverted to the alternate day system. No further cases of Brown Bast have been reported

from Stennes during 1938 though one case has occurred at Nivitigalakele.

Both at Nivitigalakelé and at Millakande the yields of younger buddings have made considerable increases over the 1937 figures. It would seem that in the early years the productive capacity of this clone is at least as great as that of any of the imported clones.

Apart from the tendency to develop Brown Bast the only important defect is the spiral fluting of the stem. This makes the trees look ugly but rarely interferes seriously with tapping, and the renewed panels seem to be flattening out. The latex is very yellow.

Hillcroft 55.—During 1938 it was established from test-buddings that two of the trees in test tapping on Stennes Estate are rogues. This accounts for a part of the great differences in individual tree yields hitherto recorded, but even when the two rogues are eliminated, there still remains a greater degree of variability than normal.

The earlier yield records of this clone have been corrected by deducting the contributions of the two rogue trees. This has caused the figures in Table I to be increased by approximately 10 grams per tapping over those published in 1938. When comparing these figures with those of other clones it should be noted that tapping was on the half spiral every third day system during 1936 and 1937.

The yield of this clone at Millakande is still rather disappointing, though there was a pleasing increase in 1938.

Wagga 6278.—This clone, which was considered to be outstanding with a yield of 28·7 grams per tapping in 1937 at 7 years old, almost doubled its yield in 1938 (48·0 grams) and now is considered to be quite the most promising clone in test at Nivitigalakele. A plot of clone P.B. 25 contiguous with the Wagga 6278 plot, though situated on rather poorer soil, gave a yield of 21·4 grams per tapping for the same period, while a plot of P.B. 23 some 50 yards away yielded 25·9 grams per tapping.

Growth is vigorous and bark renewal is excellent. The trees tend to be slightly crooked but the surface of the stem is free from irregularities. Branching is of a type unlikely to be affected by wind damage.

The reason for the number of trees in test tapping being 7 instead of 10 is that 3 of the trees originally selected were found to be rogues.

Beau Sejour 3 and Diyaberiyakande 1.—These clones are yielding at approximately the same level and both have shown very encouraging increases during 1938. Neither has shown any defect except for one case of Brown Bast and a slight susceptibility to wind damage in Beau Sejour 3. Diyaberiyakande 1 in particular is a good-looking clone with an attractive straight trunk.

The yields of the remaining clones in the table are not very high. They are included as of approximately the same yield level as the Prang Besar clones in the same area.

Comparison of Local with Imported Clones

This subject also was fully discussed in the 1938 publication in this series. The most useful figures available are those from the Experiment Station, Nivitigalakele, and from Millakande Estate, and these are again given in Table III. As stated above for the Ceylon clones at Nivitigalakele, the comparisons are not precise owing to the lack of replication. The general conclusion to be drawn from these very incomplete comparisons is that the early yields of the best Ceylon clones compare well with those of the imported clones which are at present being extensively used for replanting.

TABLE 1

Clone	Where tapped	No. of trees	Average Age in years on 1-7-38	Average Girth ins. at 3 ft. on 1-7-38	Average yield in grams dry rubber per tree per tapping for years: 1932	1933	1934	1935	1936	1937	1938	No. of tappings In 1938	Yield per tree in lb. In 1938	Tapping system
Millakande 3/2 ...	Nivitigalakele ...	12-8	8	36·0			10·7	21·1	30·4	42·5	41·5	123	11·1	½sp.a.d.
Do. ...	Millakande ...	10	9	29·5				13·7	23·0	27·7	31·6	135	9·4	do.
Millakande 1/1 ...	Nivitigalakele ...	10	8	25·8					15·9	26·0	22·7	123	6·1	do.
Do. ...	Millakande ...	10	9	26·5				15·3	22·0	24·6	28·1	135	8·4	do.
Millakande 4/3 ...	do. ...	10	9	29·5				11·2	15·8	25·7	23·8	135	7·1	do.
Hillcroft 28 ...	Stennes ...	12	12	41·0	41·9	46·7	60·0	69·3	64·5	56·6	72·6	142	22·6	do.*
Do. ...	do. ...	12	12	36·8				73·8	58·7	55·6	68·5	142	21·4	do.*
Do. ...	Nivitigalakele ...	10-9	7½	32·3					15·5	26·3	39·6	129	11·2	do.
Do. ...	Millakande ...	10	8	31·5					23·1	31·1	40·5	133	11·9	do.
Hillcroft 55 ...	Stennes ...	7	12	40·5		56·4	63·4	65·1	79·4	70·1	78·5	119	21·6	do.**
Do. ...	Millakande ...	10	8	25·5				10·4	17·6	17·6	24·0	133	7·0	do.
Wagga 6278 ...	Nivitigalakele ...	7	8	30·8					8·4	28·7	48·0	124	13·1	do.
Beau Sejour 3 ...	do. ...	10-9	8	28·6					13·5	15·9	29·5	128	8·3	do.
Diyaberiyakande 1 ...	do. ...	9	8	26·8					6·2	13·6	28·5	129	8·1	do.
Dalkeith 1 ...	do. ...	10	8	28·6					6·0	13·3	20·2	124	5·5	do.
Dalkeith 5315 ...	do. ...	10-8	8	28·5					4·6	13·2	22·0	129	6·3	do.
Kiriella 11 ...	do. ...	10	8	30·3					8·0	13·7	24·2	128	6·8	do.
Madola 18 ...	do. ...	9	8	28·1					5·1	12·2	22·5	129	6·4	do.
Millakande 1/3 ...	do. ...	10-8	7	27·6					3·3	11·3	19·7	136	5·9	do.
Illabuluwa 37 ...	do. ...	10	8	27·8					6·8	12·3	21·9	129	6·2	do.
Seedlings (Unselected) ...	do. ...	10	10	31·8					10·1	15·0	24·3	129	6·9	do.

* Tapped ½ sp.3.d. January and February.

** Tapped ½ sp.3.d. January, February and October to December.

TABLE II

Clone	Where tapped	No. of trees	Calculated yield in lb. per tree for 130 tappings on ½ sp.a.d at ages of (to nearest half year):																			
			4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12			
Millakande 3/2 ...	Nivitigalakele ...	12-8	3·0		6·0		8·7		12·2		11·7											
Do. ...	Millakande ...	10	—		—		3·9		6·5		7·9		9·1									
Millakande 1/1 ...	Nivitigalakele ...	10	—		—		4·5		7·4		6·4											
Do. ...	Millakande ...	10	—		—		4·3		6·3		7·1		8·1									
Millakande 4/3 ...	do. ...	10	—		—		3·2		4·5		7·4		6·8									
Hillcroft 28 ...	Stennes ...	12	—		—		12·0		13·4		17·4		19·8		15·2		14·0		20·4			
Do. ...	do. ...	12	—		—		—		—		—		12·7		13·4		13·6		19·2			
Do. ...	Nivitigalakele ...	10-9	—			4·5		7·5		12·0												
Do. ...	Millakande ...	10	—		—		6·6		8·9		11·6											
Hillcroft 55 ...	Stennes ...	7	—		—		—		16·1		18·1		15·2		19·0		16·8		20·8			
Do. ...	Millakande ...	10	—		2·6		5·1		5·1		6·8											
Wagga 6278 ...	Nivitigalakele ...	7	—		—		2·4		8·2		13·7											
Beau Sejour 3 ...	do. ...	10-9	—		—		3·9		4·5		8·4											
Diyaberiyakande 1...	do. ...	9	—		—		1·8		3·9		8·2											
Dalkeith 1 ...	do. ...	10	—		—		1·7		3·8		5·8											
Dalkeith 5315 ...	do. ...	10-8	—		—		1·3		3·8		6·3											
Kiriella 11 ...	do. ...	10	—		—		2·3		3·9		6·9											
Madola 18 ...	do. ...	9	—		—		1·1		3·2		6·4											
Millakande 1/3 ...	do. ...	10-8	—		—		0·7		3·0		5·6											
Illabuluwa 37 ...	do. ...	10	—		—		1·5		3·2		6·3											
Seedlings (Unselected) ...	do. ...	10	—		—		—		—		2·9		4·3		7·0							

TABLE III

Clone	Where tapped	Year budded	Average girth ins. at 3 ft. on 1-7-38	Calculated yield in lb. per tree for 130 tappings at ages of:									
				5	5½	6	6½	7	7½	8	8½	9	9½
Millakande 1/1 ...	Nivitigalakele ...	1930	25·8	—		4·5		7·4		6·4			
Hillcroft 28 ...	do. ...	1930	32·3		4·5		7·5		12·0				
Wagga 6278	do. ...	1930	30·8	—		2·4		8·2		13·7			
Beau Sejour 3... ...	do. ...	1930	28·6	—		3·9		4·5		8·4			
Diyaberiyakande 1	do.	1930	26·8	—		1·8		3·9		8·2			
Prang Besar 23 ...	do. ...	1930	27·3		1·3		2·7		7·8				
Prang Besar 25 ...	do. ...	1930	27·4	—		1·4		3·9		6·1			
Millakande 3/2 ...	Millakande	1929	29·5	—		3·9		6·5		7·9		9·0	
Millakande 1/1 ...	do.	1929	26·5	—		4·3		6·3		7·1		8·0	
Millakande 4/3 ...	do.	1929	29·5	—		3·2		4·5		7·4		6·8	
Hillcroft 28	do.	1930	31·5	—		6·6		8·9		11·6			
Hillcroft 55	do.	1930	25·5	2·6		5·1		5·1		6·9			
Tjirandji 1	do.	1930	31·5	3·3		6·1		5·7*		7·8*			
B.D. 2	do.	1930	23·3	—		3·0		4·6		3·6			
B.D. 5	do.	1930	24·5	—		3·3		4·5		4·1			
B.D. 10	do.	1930	23·5	—		3·1		4·7		4·3			

* Tapped on 1/3 spiral.

TABLE IV.

YIELDS IN 1938.

CLONES IN TEST-TAPPING.

Clone	No. of trees	Age in years	Girth at 3 ft. in ins.	No. of tappings	Yield per tree in lbs.
	5th Tapping Year				
Millakande 3/2	8	8	36·0	123	11·1
	3rd Tapping Year				
Wagga 6278	7	8	30·8	124	13·1
Hillcroft 28	9	7½	32·3	129	11·2
Beau Sejour 3	9	8	28·6	128	8·3
Diyaberiyakande 1	9	8	26·8	129	8·1
Kiriella 11	10	8	30·3	128	6·8
Madola 18	9	8	28·1	129	6·4
Dalkeith 5315	8	8	28·5	129	6·3
Illabuluwa 37	10	8	27·8	129	6·2
Millakande 1/1	10	8	25·8	123	6·1
Heneratgoda 24	10	8	24·3	124	5·9
Millakande 1/3	8	7	27·6	136	5·9
Dalkeith 1	10	8	28·6	124	5·5
Bandarapola 8	10	7½	26·4	136	5·5
Kiriella 12	9	8	29·1	127	5·4
Alpitakande 18775...	8	7	26·3	136	5·2
Bandarapola 21	10	7	27·0	136	5·0
St. George 40	10	8	29·5	124	4·8
Dalkeith 19935	10	8	28·4	124	4·7
Rilhena 10	10	7½	28·6	135	4·5
Kiriella 1	10	8	30·2	127	4·4
Heneratgoda 82	9	8	26·7	128	4·4
Culloden 3	10	7	27·6	128	4·4
Talagalla 4	9	8	29·1	128	4·4
Yogama 20Y	10	7½	30·0	130	4·4
Culloden 5	9	8	26·0	129	4·3
Kosgalla 6	9	8	29·0	123	4·2
Eriagastenne 1	10	7	26·3	136	4·1
Maddagedera 374	8	8	28·0	128	4·0
Rilhena 15	9	7	27·1	136	4·0
Glendon 6	10	8	29·0	124	3·5
Troy 4/6	10	7	27·3	131	3·5
Passara 338	10	7	27·1	131	3·1
Heneratgoda 140	10	8	26·3	126	3·0
St. George 39	9	8	28·0	129	2·9
Rilhena 9	10	7½	24·8	135	2·7
Passara 226	10	7	25·7	129	2·3
Cottagalla 37	8	7	28·9	131	1·9

TABLE IV—(*Contd.*)

Clone	No. of trees	Age in years	Girth at 3 ft. in ins.	No. of tappings	Yield per tree in lbs.
	2nd Tapping Year				
Malaboda 1	10	8	23·4	129	4·7
Elston 2313/16	10	7	25·3	129	4·5
Nakiadeniya 3	10	8	24·8	128	3·6
Frocester 120	9	7½	26·6	129	3·5
Culloden 4	8	8	25·8	129	3·3
Tempo 15	8	7	24·5	132	3·3
Diyaberiyakande 4...	9	8	25·2	129	2·9
Frocester 168	10	7½	26·1	129	2·8
Guava Hill 51	10	7	25·0	130	2·6
Illabuluwa 147	9	7	26·0	131	2·1
Illabuluwa 108	10	7	25·3	136	2·1
Panagula 34/5	10	7	25·3	129	1·6
	1st Tapping Year (March to December only)				
Talgaskande 1/5	10	7	23·3	109	3·6
Dalkeith 3513	9	8	24·3	103	3·4
Madola 22	10	8	24·8	103	3·4
Markville 1	10	6½	25·3	104	3·0
Tempo 6	10	7	23·8	109	2·8
Hunasgiriya 1391	10	7½	21·3	104	2·5
Alpitakande 843	10	7	21·8	108	2·5
Nakiadeniya 1	9	7	21·7	103	2·3
Nakiadeniya 4	10	7½	23·0	103	2·2
Humbaswalana 7/1	10	7	26·2	108	2·2
Warriapolla 76	14	7	23·3	103	2·1
Elston 2239/12	9	7	21·7	103	1·7
Warriapolla 57	6	8	21·8	104	1·7
Guava Hill 47	10	7	22·2	109	1·7
Eriagastenne 2	10	7	22·3	109	1·5
Millakande 13/2	10	6	23·0	109	1·4
Guava Hill 50	10	7	22·8	109	1·3
Warriapolla 24	10	8	22·7	102	1·1

TABLE V

YIELDS IN 1938.

CLONES IN SEMI-COMMERCIAL TAPPING

Clone	No. of trees	Age in years	No. of tappings	Yield per tree in lbs.
Yogama 8Y	46	8-9½	125	7·3
Millakande 3/2	55	7-8	120	6·9
Kobowella 41	65	8-9½	125	6·8
Govinna 771	68	9-11	124	6·3
Mirishena 11	40	8-9½	130	6·2
Cuilcagh 4	91	9-11	120	6·0
Lavant 28	73	9-11	120	6·0
Govinna 1836	68	9-11	120	5·7
Eladuwa 1	146	8-9½	125	5·1
Kobowella 42	92	8-9½	130	5·0
Glendon A. 4	71	8-9½	130	4·9
Cuilcagh 5	79	9-11	120	4·9
Mirishena 2	32	8-9½	125	4·9
Palmgarden 4849	84	8-9½	130	4·8
Madola 110	41	8-9½	130	4·7
Palmgarden 3183	24	8-9½	130	4·6
Eladuwa 5	67	9-11	120	4·5
Eladuwa 4	94	8-9½	126	4·5
Heneratgoda 2	71	9-11	120	4·5
St. George 45	83	9-11	120	4·3
Mirishena 3	103	8-9½	125	4·2
Cuilcagh 3	61	9-11	124	4·0
Millakande 10/2...	82	8-9½	126	4·0
Beau Sejour 5	30	8-9½	125	3·9
Yogama 21Y	110	8-9½	125	3·9
Lochnagar 1/15	66	9-11	124	3·7
Frocester 56	71	8-9½	125	3·3
Yogama 1H	70	8-9½	130	2·7
Eladuwa 3	54	8-9½	122	2·5
Talagalla 2	49	8-9½	125	2·4
Madola 15	27	8	124	1·5

Clones whose yields were formerly published in this series in italics.

FIELD EXPERIMENTS ON DARTONFIELD ESTATE—VIII

MANURING EXPERIMENT WITH MATURE RUBBER (1938).

L. A. WHELAN, *Soil Chemist*
and
C. A. DE SILVA, *Assistant Botanist*

THIS paper summarises the yield records and growth measurements for the second year of a manurial experiment on Dartonfield Estate. The scope and design of the experiment and the statistical methods employed were described in the Quarterly Circulars, Vol. 13, Parts 2 and 3, 1936 and Vol. 15, Part 1, 1938 and are briefly recapitulated below :—

Treatments

The fertiliser treatments are—

N	Nitrogen only
NP	Nitrogen and Phosphoric Acid
NK	Nitrogen and Potash
NPK	Nitrogen, Phosphoric Acid and Potash
O	No manure

The manures were applied on a tree basis in December, 1936, and December, 1937, at the rate of N=P=K=0.4 lb. per tree. The quantities of fertiliser used in 1937 were :

N	1·90 lbs. Sulphate of Ammonia, per tree
P	1·35 lbs. Mineral Phosphate, per tree
K	·78 lbs. Muriate of Potash, per tree

Slight variations in stack analysis account for small differences in the amounts of fertiliser added in different years. The plots with complete manure receive about 4 lbs. per tree of a balanced mixture.

The third application of manure which according to the original plan was due in December, 1938, was postponed until March, 1939 ;

an alteration which brings the experiment into line with the general recommendations for the time of manuring mature Rubber. As the growth measurements discussed in this paper were taken in January, 1939, they have not been influenced by any manurial treatment later than December, 1937.

Provision was originally made for a comparison of two methods of applying the fertiliser in the presence of a cover of Pueraria :

(1) Envelope forking Pueraria and other green loppings with the fertiliser.

(2) Broadcasting the fertiliser over the Pueraria.

Phosphate appears to be the limiting factor for the successful establishment of Pueraria under local conditions and the successful growth of the cover in this experiment is restricted to plots treated with this nutrient. For an accurate comparison of the cover crop treatment according to the layout of the experiment the cover should be well established for every plot, and the feasibility of giving a basal dose of phosphate to the whole area in order to bring about the desired condition is under consideration. Up to the present, as a modification of the original cover crop treatment, a comparison has been made of the two methods of applying the artificials : broadcasting and forking, the cover where it occurs being left undisturbed.

Layout.—The unit plot size is 20 trees. There are four main blocks each divided into two sub-blocks. Each sub-block is a complete replication of the five fertiliser treatments, and the two methods of applying the manure are allotted to the sub-blocks in randomised pairs. Thus the main treatment comparison is replicated eight times, and the comparison between methods of application four times.

Tapping.—The system of tapping is the Double-Four. One sub-block of 100 trees constitutes a tapper's task and the tappers are rotated between sub-blocks every two months. In this way any variation due to the skill of different tappers is eliminated. The order in which the several plots within a block are tapped is changed daily in rotation.

The height of the cuts is somewhat variable as tapping had to be continued in whatever position the cuts happened to be, but measurements made early in 1937 showed that the averages from the various treatments were satisfactorily uniform.

Recording.—The yield of each plot is recorded for every tapping in grams of latex. A determination of the dry rubber content is made by trial coagulation and the weight of dry rubber thus calculated. The scrap is also weighed. Days on which the latex cannot be fully collected owing to rain are disregarded.

Age of Trees.—The present age of the trees in Blocks 1 and 2 is 26 years, in Block 3, 29 years and in Block 4, 22 years.

Results

Yield.—The trees were tapped and the yields recorded for 1936, with the object of gaining information on the initial variation between plots, *i.e.*, before the application of manures. These preliminary yields are used as a means of adjusting later yields and the statistic employed, the " regression co-efficient " is described in a previous circular (Vol. 15, Part 1, page 3).

Table I gives the yields in kilograms per plot of 20 trees for the preliminary year 1936 and the experimental years 1937 and 1938. To obtain the approximate values for pounds per acre each figure should be multiplied by 11.

TABLE I

Mean Yields in Kilograms Dry Rubber per Plot of 20 Trees

Treatment	Preliminary Year 1936	Adjusted Yields 1937	Actual Yields 1938	Adjusted Yields 1938	Adjusted Yields 1938 as % of the Control
N	53·4	49·8	57·4	56·9	114
NP	52·3	47·5	52·2	52·9	106
NK	55·5	49·1	59·0	56·5	113
NPK	56·5	49·6	62·7	59·3	119
O	47·1	44·8	44·2	50·0	100
Means	53·0	48·2	55·1	55·1	
		Standard error=1·2	—	1·8	3·6
		Significant difference (P=·05)=3.5	—	5·3	10·6

Examination of the last column of the table shows the effect of the treatments on the yield : the manured plots N, NK and NPK all show a significant increase (20 : 1 probability) when compared with the unmanured plots. The response to NP is not significant and this considered, in the light of the other results, suggests a depressing effect of phosphate in the absence of potash. The fact that a similar depressing effect has been observed elsewhere increases the value of the above finding. It must be pointed out, however, that if the more stringent test of significance (100: 1) is applied the response to fertilisers shown in this experiment is not quite significant. This, taken in conjunction with the unfortunate random arrangement of the plots, inclines to the belief that the apparent increases shown in the table should be treated with reserve, for the present.

In the previous year 1937 there are indications of a similar, but not so marked, response; nitrogen alone and with the minerals, had apparently already exercised a beneficial effect on yield.

Method of Applying the Manure.—The figures for the comparison between broadcasting and forking are given in Table II.

TABLE II

Mean Yields in Kilograms of Dry Rubber per Plot of 20 Trees

Treatments	Adjusted Yields	
	1937	1938
Manure Broadcast	48·5	55·1
Manure Forked in	47·8	55·1
Mean	48·2	55·1

The results to date show no significant difference in yield between the two methods of application.

Girth Increment.—The girth of every tree was measured at a height of 4 feet from the ground. The mean figures for the different treatments in the years 1937, 1938 and 1939 and the yearly increments are given in Table III.

TABLE III

Girth Measurements in Inches

Treatments	March 1937	January 1938	January 1939	Increment 1937/38	Increment 1938/39
N	35·76	36·32	36·53	0·56	0·21
NP	37·32	37·95	38·13	0·63	0·18
NK	39·19	39·81	39·97	0·62	0·16
NPK	37·10	37·74	37·97	0·64	0·23
O	33·78	34·33	34·54	0·55	0·21
Mean	36·63	37·23	37·43	0·60	0·20

The treatment effects for the periods 1937-38 and 1938-39 are not significant. Taking into account the errors inherent in the method of measuring, the growth can for all practical purposes be regarded as at a standstill during the 1938-39 period. This lack of response may perhaps be attributable to the severe attack of Oidium early in the year and to the low rainfall and its abnormal distribution in 1938.

Bark Renewal.—In January, 1938, measurements were made of the bark renewed since the previous January, the period covered by the manurial treatment. The points at which the measurements were made had invariably developed a burr and it was found necessary to make the second series of measurements about half an inch away from the original points, but at the same level. The instrument used in 1938 had caused unnecessary damage to the bark. The new instrument used in 1939 has working parts of smaller dimension. A comparison of the two instruments necessitated a correction of last year's results and the corrected values are presented in Table IV.

TABLE IV

Thickness of Renewed Bark in Millimetres (for periods of 12 months)

Treatments	1938	1939	Increment 1938/39
N	4·8	5·3	0·5
NP	4·7	5·6	0·9
NK	4·8	5·4	0·6
NPK	4·8	5·6	0·8
O	4·9	5·5	0·6
Mean	4·8	5·5	0·7

The results are not significant, but considered as a whole support the findings, already mentioned, of a general lack of regeneration during the year under review.

Subsequent investigations with different instruments for measuring bark thickness point to a number of factors that might lead to error in the measurements, but the mean results for different treatments show that over a population of 2,000 trees these errors have been evenly distributed.

Whilst the yield results for the manurial treatments show in the first and second years some evidence of a response to fertilisers, it must be remembered that this is a long term experiment and that definite conclusions cannot be drawn at this early stage.

Summary

(1) The scope and design of an experiment on Dartonfield Estate to determine the manurial requirements of mature Rubber are briefly described.

(2) The results for the first two years (1937 and 1938) after the initial application of fertilisers are given in terms of yield, girth increment and bark renewal.

(3) When compensation is made for the initial differences shown by the uniformity trial of 1936 the manured plots are seen

to have given a higher yield than the unmanured. In 1937 this difference is just significant as judged by the ·05 probability test. In 1938 the difference is greater and approaches the more stringent ·01 standard. For reasons stated this apparent response to manures must be treated with reserve.

(4) There are indications, satisfying the ·05 probability level, that the absence of potash from an NPK fertiliser has a depressing effect on yield.

(5) For the period 1938-39 the growth appears to have been at a standstill judged by both girth increment and bark renewal figures.

(6) In this experiment phosphate appears to be a limiting factor for the growth of Pueraria. With the object of securing an accurate comparison of cover crop treatments the application of a basal phosphate dressing is under consideration.

PLANTING NOTES

PROMISING LOCAL CLONES

CERTAIN of the local clones under trial at Nivitigalakele Experiment Station have attained a sufficiently high standard of performance to be regarded as being of economic interest. None of them can be described as " proved, " but a stage has been reached at which it has become desirable to provide facilities for the establishment of the clones in estate nurseries, with a view to the rapid multiplication of any clone which is shown by further test tapping to be suitable for commercial planting. The latest records of these clones are published elsewhere in this issue.

When the clones were established at Nivitigalakele no restrictions were laid down by the owners of the mother trees in regard to the future use of the material, but their proprietary rights in the clones are recognised by the Rubber Research Board. At the same time the local rubber industry in general is entitled to certain rights in the material since a large sum of money has been expended by the Research Scheme in testing these and other clones at Nivitigalakele. As the result of discussions with the proprietors of the clones it has been agreed that the following rights shall be accorded to the Rubber Research Board :—

(*a*) To supply budwood to estates in Ceylon in quantities not exceeding 5 yards to any one estate at the price of Rs. 15/- per yard, subject to an undertaking being given by each proprietor that the material will not be redistributed. A royalty of 50 per cent. of the price to be payable to the proprietors of the clones.

(*b*) To supply any quantity of budwood or budded stumps to persons eligible to purchase material through the Smallholdings Department of the Rubber Research Scheme (*i.e.*, proprietors of less than 30 acres of rubber) without disclosing the identity of the material. No royalty to be payable on such sales.

(*c*) To supply small quantities of budwood or budded stumps to Rubber Research Institutes in other countries for experimental purposes, subject to an undertaking being given that the material will not be redistributed.

The above arrangements apply at present to the following clones:—

Hillcroft 28 (HC. 28)
Millakande 1/1, 4/3, 3/2, (MK. 1/1, 4/3, 3/2)
Diyaberiyakande (Culloden) 1 (DBK. 1)
Wagga 6278 (WG. 6278)
Beau Sejour 3 (BS. 3)
Dalkeith 1, 5315 and 19935 (DK. 1, 5315 and 19935)
Bandarapola 8 and 21 (BP. 8 and 21).
Kiriella 11 (K. 11)
Heneratgoda 24 (H. 24)

Material is being multiplied at the Nivitigalakele nurseries from budded trees which have been test tapped and shown to possess the desirable characteristics of the clones concerned. Small quantities of budwood will probably be available for distribution towards the end of 1939 and orders are being booked in rotation for delivery as the material becomes available.

T. E. H. O'B.

SUPPLIES OF PLANTING MATERIAL

As notified in a recent issue of the *Quarterly Circular* budwood and budded stumps are now only supplied by the Research Scheme to persons who come within the purview of the Smallholdings Department (*i.e.*, the proprietors of Rubber lands not exceeding a total area of 30 acres), except that special arrangements, referred to above, have been made for the distribution of budwood of promising local clones, and temporarily, for supplying small quantities of material of certain imported clones which are not easily available from local commercial sources.

The following notes on the sources from which planting material can be obtained have been compiled in view of frequent requests for information on the subject.

Prang Besar, Glenshiel, Pilmoor Clones

Material of these clones is sold under agreement and is only obtainable from the proprietors. The local agents are :—

Prang Besar and Glenshiel clones ... ... Messrs. Harrisons & Crosfield, Ltd., Colombo

Pilmoor clones ... ... Messrs. Whittall & Co., Colombo

Tjirandji and Bodjong Datar Clones

There is no restriction on the distribution of material of these clones. It is available from numerous commercial sources in Ceylon.

Pilmoor Estate ... Duoclone area (A44 and B84)

This material is available from the same sources as the Prang Besar and Pilmoor clones.

Attention is drawn to the article on p. 31 in which the merits of Buddings and Clonal Seedlings are discussed.

T. E. H. O'B.

TEST TAPPING SAMPLES

Recording of the yields of individual trees in test tapping is now undertaken by the Research Scheme on a scale which made it worth while to consider the question of converting the tapping samples after weighing into marketable rubber. Hitherto

Prang Besar Clones.

Since going to press, information has been received that local importers of Prang Besar budding material in 1930/1931 have been released from the agreements restricting the re-distribution of the material.

Clonal Seed.

Borrowdale estate clonal seed (A and B) has recently been approved for planting under the regulations of the Rubber (New Planting) Ordinance, 1938. It is obtainable from the Proprietor, Mr. F. D. Till.

Prang Besar, Glenshiel, Pilmoor Clones

Material of these clones is sold under agreement and is only obtainable from the proprietors. The local agents are :—

Prang Besar and Glenshiel clones ... ... Messrs. Harrisons & Crosfield, Ltd., Colombo

Pilmoor clones ... ... Messrs. Whittall & Co., Colombo

Tjirandji and Bodjong Datar Clones

There is no restriction on the distribution of material of these clones. It is available from numerous commercial sources in Ceylon.

Clones Available from the Rubber Research Scheme

As a temporary measure small quantities of budwood of the following clones can be supplied :—

A.V.R.O.S. 157, 163, 214

Bogorredjo 2

These clones are not recommended for commercial planting, but are of interest as seed parents.

Certain material was issued under Research Scheme numbers during the period that the importation of planting material from abroad was prohibited. This material is not now available.

Clonal Seed

The grades of clonal seeds at present approved for planting under the regulations of the Rubber (New Planting) Ordinance, 1938, are :

Prang Besar Estate ... Isolated seed gardens

Pilmoor Estate ... Duoclone area (A44 and B84)

This material is available from the same sources as the Prang Besar and Pilmoor clones.

Attention is drawn to the article on p. 31 in which the merits of Buddings and Clonal Seedlings are discussed.

T. E. H. O'B.

TEST TAPPING SAMPLES

Recording of the yields of individual trees in test tapping is now undertaken by the Research Scheme on a scale which made it worth while to consider the question of converting the tapping samples after weighing into marketable rubber. Hitherto

the dried " biscuits " have been made into scrap grades in common with tree and shell scrap.

In the usual method of preparing the samples the latex obtained at each tapping is coagulated in the latex cup with acid containing a small proportion of paranitrophenol, pressed out roughly by hand and suspended on a wire beside the tree. Periodically the samples are collected for drying and weighing. After one or two weeks' exposure to the weather the biscuits are usually dark brown or black through enzymatic oxidation.

It has been found that the darkening of the biscuits is usually much reduced by omitting the paranitrophenol and adding sodium bisulphite with the coagulant. There are a few clones which do not respond to the addition of bisulphite but in the majority of cases the improvement is marked.

A convenient stock coagulating solution is the following :—

Acetic acid	4 oz.
Sodium Bisulphite	4 oz.
Water	5 gallons

Of this solution the tapper adds a quantity equal to about half the volume of latex in the cup.

Aqueous solutions of sodium bisulphite rapidly lose their reducing power when kept. Mixed with acetic acid, however, they are comparatively stable and the above stock solution can be kept quite safely for a month.

As the object of improving the colour is to obtain a higher price for the rubber it is relevant to enquire what premium is likely to result from the adoption of the above procedure. An indication of this is afforded by the details of a recent invoice of blanket crepe prepared from three grades of test tapping rubber which was sold in Colombo. The following figures are the prices per lb. realised less the current price of coupons :—

(A) With bisulphite, light biscuits	$5\frac{1}{4}$ cts.
(B) With bisulphite, dark biscuits	$2\frac{1}{2}$ cts.
(C) Without bisulphite	$2\frac{1}{2}$ cts.

A and B were obtained in the proportion of 3 to 2, so that the result of the treatment was to raise the mean price of the rubber by $1\frac{3}{4}$ cents per lb. This represents a net gain after deducting the cost of sodium bisulphite of about Rs. 160/- on 10,000 lbs. of rubber.

The advantage is not a large one, but it is worth taking because there is no extra trouble involved in using bisulphite. The information may be of interest to estates on which test tapping is undertaken.

M. W. P.

MEMORANDA ON PLANTING TOPICS

Typescript copies of the following memoranda may be obtained on application :—

Notes on budgrafting procedure (revised March, 1939).

Programme of manuring for replanted Rubber clearings (revised January, 1938).

Contour lining, holing and filling, cutting of platforms, trenches and drains.

Notes on Rubber seedling nurseries.

Notes on the care of budded trees of clone Tjirandji 1 with special reference to wind damage.

Dartonfield estate factory—Notes on procedure and equipment.

Straining box for latex.

THE QUALITY OF PLANTATION RUBBER*

By

T. E. H. O'BRIEN, *Director*

IT is well known to those connected with the technical side of the rubber industry that raw rubber is not a uniform product and that there are marked variations in the properties of different consignments, as revealed by the behaviour of the material when used in manufacturing processes. It is hardly surprising that this is the case since latex is not a pure chemical but a complex biological fluid which may be expected to vary in composition according to a variety of factors. Extensive research on the causes and extent of variability has been carried out by the Rubber Research Scheme and other research organisations, and a great deal of information on the subject is available.

Types of Variability

Variability in the quality of raw rubber is a source of much inconvenience and loss to manufacturers and it is not overstating the position to say that consumers in general are by no means satisfied with the present standard of uniformity of plantation rubber. In recent years complaints on the subject have been made particularly by American manufacturers and their views were put forward very ably by Mr. G. A. Sackett, Chief Chemist of the Goodyear Tyre & Rubber Co., at a meeting of the Rubber Division of the American Chemical Society held in New York in 1935. Dr. E. Rhodes, head of the Chemical Division of the Rubber Research Institute of Malaya, was present at the meeting and followed with an address in which he dealt with the causes of variability and described the work which the Institute was doing in trying to eliminate such sources of variation as are within the control of the producer.

* An address given to the Sabaragamuwa Planters' Association on October 21st, 1938.

The main directions in which variability of properties occur are :—

(*a*) Rate of vulcanisation.
(*b*) Plasticity or hardness.
(*c*) Ageing properties.

Extent of Variability

It has been stated recently that variability in the rate of vulcanisation is such that it is possible to find plantation rubber which will hardly vulcanise at all in a standard mixing, whereas other rubber will vulcanise so rapidly as to " set up " on the mixing rolls, *i.e.*, will start to vulcanise before the ingredients are properly mixed with the rubber. As regards plasticity, an examination of rubber from 300 Ceylon estates which was made some years ago at the Imperial Institute indicated that the range of variation was approximately 100 per cent. The implication of this form of variability is that one batch of rubber may take twice as long as another to break down on the mixing rolls before the compounding ingredients can be incorporated. I have no definite data regarding the normal range of variability in ageing properties but there are undoubtedly large differences, which are reflected in poor durability of the vulcanised products.

It is quite understandable that these variations are a source of inconvenience to consumers especially under modern manufacturing conditions which call for careful standardisation of all factory operations. Advances which have been made in the technique of rubber compounding in recent years have given the manufacturer the means of regulating the properties of rubber to suit his needs by the use of accelerators, softeners and anti-oxidents, and he is more concerned to have raw rubber of uniform quality than that the properties should conform to any particular standard. In many of the larger factories variability is partially overcome by blending a number of consignments of raw rubber before use.

Marketing Methods

It may well be asked why rubber is still marketed on the basis of appearance if the inner quality of the product is of greater importance to the consumer. I think the best way of answering that question is to say that a number of the large consumers are

gradually obtaining a certain degree of control over the quality of the rubber they purchase. As you are aware several of the large tyre manufacturers have their own estates, notably Goodyear, Dunlop, Firestone, U.S. Rubber Co., Michelin, from which at least part of their supplies are drawn. In such cases factory procedure is regulated so that the product suits their requirements. One large continental firm arranges contracts with estates on the understanding that a specified factory procedure shall be followed. There is also a good deal of selective buying to the extent that consumers know the names of the estates whose rubber suits them and endeavour always to buy the produce from these estates. This tendency has increased considerably in recent years. Several of the large manufacturing companies have their own buyers in eastern countries and while it is not known whether they do, in fact, buy selectively they are in a very favourable position to do so. It is probably more satisfactory that developments should take place along these lines than that any attempt should be made to effect a drastic alteration in marketing methods.

Sources of Variability

The sources of variability in raw rubber may be summarised under four headings :—

(1) Source of latex.
(2) Tapping method.
(3) Changes in the latex between tree and factory.
(4) Factory procedure.

Referring to the source of the latex, the composition and hence the properties are liable to vary according to the season of the year, age of the trees, geographical situation and soil conditions, and the genetic strain. The last factor is probably not of great importance in a mixed population, but will assume special significance when large areas of buddings come into production.

You are aware that the tapping system affects the rubber content of the latex and it may, therefore, be expected to have a corresponding effect on the non-rubber substances which have a pronounced influence on the properties of the rubber. For example the adoption of a severe tapping system leads to a reduction in rubber content and organic substances and an increase in minerals. When a new

tapping cut is opened the latex is definitely abnormal in composition for several weeks, hence rotational tapping systems, especially those which involve a relatively short resting period, tend to increase variability in the quality of the product.

These two sources of variation which are probably the most important ones, may be regarded as outside the control of the planter. It is true that the Estate Proprietor has control over the tapping system, but I am not prepared, at the present time, to condemn any particular system on the ground that it increases variability.

Factory Treatment

On the other hand the treatment of the latex after it leaves the tree is within the Planter's control and every effort should be made to minimise variations by the adoption of standardised methods. The use of dirty utensils and delay in handling latex lead to fermentation setting in and this will affect the vulcanising properties of the rubber. Inside the factory the most important step which can be taken to promote uniformity is to bulk the latex from as large an area as possible. In recent years Shanghai coagulating jars have been largely replaced by tanks in which the latex from the whole estate or from each division of a large estate is bulked before coagulation. Those who have made this change have no doubt found it easier to prepare a product of standard appearance, particularly as regards colour in crepe manufacture, and it is not difficult to see that bulking will promote a similar standardisation in the inner properties of the rubber.

Generally speaking any improvement in factory equipment tends to promote uniformity. For example the replacement of hand sheeting rollers by a line-ahead battery will speed up the rolling process and thus minimise the differences between the first and last sheets of the day's crop. In crepe manufacture the provision of facilities for warm air drying will result in the crepe being dried at a uniform rate irrespective of weather conditions, and so on. Apart from the question of equipment, the latex should be diluted, coagulated, and rolled according to the standard methods recommended by the Research Scheme. In short, every effort should be made to ensure that variability which arises from factors outside the control of the Planter is not increased by abnormal treatment in the factory.

Research on Variability

The Rubber Research Board has decided to undertake research work with a view to promoting the uniformity of plantation rubber in Ceylon. The necessary testing equipment has been installed and the work will be taken in hand when Mr. Philpott, our chemist, returns from home leave next month. Later on it will be open to any estate to send us samples of their rubber for examination and, if it proves to be abnormal in properties, it may be possible to suggest methods of improvement.

Dirt in Rubber

So far I have dealt with what may be termed the hidden properties of the rubber and I want now to speak briefly about another aspect of quality, namely, the question of dirt in rubber. The introduction of grit into the latex is quite unavoidable under estate conditions, but all except the finest particles can be eliminated in the factory by correct treatment. The essential feature is the provision of a settling tank in which the latex is diluted and allowed to stand for an hour to enable grit to settle to the bottom of the tank. It is then run off through an outlet slightly above the bottom of the tank and is passed through a fine sieve into the coagulating tank. The cost of a settling tank built with white English tiles to hold 800 gallons of latex is approximately Rs. 250/- which is a very small expenditure to incur in the interests of improved quality.

Latex Sieves

The type of sieve now commonly in use is not very suitable except for coarse straining before the latex is "weighed up." I can recommend it for this purpose using gauze of 30 mesh. For fine straining after settling it is preferable to use a sieve of a type in which the latex passes upwards or sideways through the mesh which is kept immersed in the latex. At Dartonfield we use a box strainer of a type designed by the Rubber Research Institute of Malaya, in which the latex passes sideways through two screens and overflows at the end of the box. The screens are fitted in frames which slide into slots in the sides of the box. Two sets of screens and slots are provided so that they can be withdrawn for cleaning in turn without interrupting the flow of latex. This type

of strainer is very cheap to construct and particulars can be supplied on request. For ordinary estate purposes screens of 40 and 50 mesh are suitable but finer gauze may be used if desired.

There are two other common sources of dirt in rubber. Firstly, dirt may fall on to the dry rubber in the factory, either grit, wood powder, termite droppings, etc., from old ceilings or rust and paint scales from the roof. In two cases which I investigated recently the rubber was contaminated with termite pellets and with rust scales respectively. This source of dirt can be partly prevented by providing an efficient ceiling in the packing room or by covering the finished rubber with dust sheets.

Packing of Rubber

A second important source of contamination is in the transport of the rubber to Colombo. Before the depression it was the almost universal custom for rubber to be packed in chests on the estates, but now most of it is dispatched either in open bundles tied with coir rope or in coir wrappers. Much of the rubber from Ceylon is now shipped in bales or, if dispatched in chests, the shipper prefers to do his own packing. It is, therefore, unlikely that estates will revert to the practice of packing in chests. It may also be mentioned that the " momi " chests which were frequently used led to contamination of the rubber with splinters. Every precaution should be taken to keep the rubber clean during transit. If coir wrappers are used they should be lined with fabric to prevent the rubber becoming contaminated with fibre. Coir rope should be pre-treated with a size made from flour and sodium silicate for the same reason. If the rubber is sent loose, dust sheets should be provided to lay on the floor of the lorry and to cover the rubber. Canvas bags which can be re-used many times are obtainable in Malaya and are being used experimentally at Dartonfield with very satisfactory results. It is understood that much of the rubber used in Japan is shipped from Singapore in these bags.

Copper Contamination

When dealing with the subject of latex sieves I purposely omitted to refer to the material which should be used for the mesh. Rubber is very sensitive to the action of certain metallic impurities, notably copper which acts as an oxidation catalyst and leads to rapid

deterioration of the rubber. The presence of even a minute quantity of copper, of the order of 1 part in 100,000, while not sufficient to have any visible effect on the raw rubber leads to rapid deterioration of the vulcanised product. The most obvious source of copper contamination of rubber lies in the use of brass mesh for latex sieves and manufacturers have asked that the use of this material on estates should be discontinued. Trials carried out by the Rubber Research Institute of Malaya and the Rubber Research Scheme have shown that stainless steel, monel metal and nickel are satisfactory alternatives and that, whilst more expensive, the extra cost is partly or wholly counterbalanced by greater durability. The maximum additional cost of using one of these materials is estimated at 1/100 cent per lb. of rubber. I would urge every estate Superintendent to discontinue the use of brass mesh in his factory without delay.

Premium for Improved Rubber

Questions which have been put to me on more than one occasion by Rubber Producers are :—Why should we go out of our way to bother about the inner properties of rubber when the market only asks for good appearance? Is there any prospect of getting a better price if we make a product of better quality? Quite frankly the answer to those questions is that it is unlikely that a premium can be obtained except in individual instances. The argument of the manufacturer is that he is entitled to a first-class product when he pays for No. 1. quality rubber.

Competitive Products

I think the Rubber Producer must look at the subject from the broader aspect of maintaining the use of raw rubber to the fullest extent in the face of various competitive products. Among these may be mentioned artificial rubber, reclaimed rubber and various "rubber substitutes." A paper dealing with the present status of synthetic or artificial rubber was published recently in our *Quarterly Circular* and I need not say much about it now. For certain purposes it is superior to raw rubber and it has the advantage that being prepared under controlled conditions, it is free from the variations in quality which are a feature of plantation rubber. Apart from its development in totalitarian countries on politico-economic grounds its use for special purposes is extending in other countries

and there is a risk that this trend will increase if the quality of natural rubber is not improved to meet the wishes of consumers. Reclaimed rubber is also a strong competitor. For many purposes it can be used alternatively with raw rubber and, while the proportionate consumption of raw rubber and reclaim mainly depends on the price factor, there are obvious risks of its use being preferred on the grounds of greater ease of handling. Various "Rubber substitutes," such as vulcanised vegetable oils, organic polysulphides and certain grades of bitumen can also be used to replace raw rubber to varying extents.

In conclusion I should like to point out that the recommendations I have made in the course of this address do not entail large expenditure. Apart from the suggestion that improved factory equipment reduces variability, what I have mainly asked is that more attention should be given to the standardisation of factory procedure with a view to ensuring that unavoidable variations in quality are not enhanced by faulty handling of the latex.

BUDDINGS AND CLONAL SEEDLINGS*

Introduction

WHETHER to budgraft or whether to plant clonal seed? This question has aroused much interest recently. Strong and conflicting opinions have been expressed, and with the new planting which is now allowed, and the increasing amount of re-planting, the question has become extremely important. It therefore seems desirable to publish a short account of the main facts regarding budgrafts and various types of seedlings.

There are two ways of obtaining high-yielding rubber trees. One is to take buds from outstanding individual trees and to graft them on to suitable stocks. The other is to plant seeds obtained from high-yielding trees. Whichever method is chosen it must be proved that the plants so obtained will actually give the high yields expected of them. This proof takes several years of careful work, but it must be obtained before extensive planting can be advised without serious risk of failure and disappointment.

Buddings

Between 1918 and 1924 many hundreds of clones were made by research stations, by private organisations, and by keen estate managers in the Netherlands East Indies and Malaya.

The method briefly was to select a high-yielding tree and to graft buds from it on to ordinary unselected seedlings. The collection of budgrafts or buddings thus grown from buds taken from a single tree is called a clone (from the Greek, *klonos*, a twig). With buds taken from the first buddings of a clone more buddings can be made, also belonging to the same clone, and so on indefinitely. It is particularly interesting to note that some of the most promising clones such as the Tjirandji, Bodjong Datar, Prang Besar and Glenshiel clones owe their origin to the efforts of a small number of

*Reproduced from the Planters' Bulletin of the Rubber Research Institute of Malaya, No. 2, 18th March, 1939, by courtesy of the Director.

enthusiastic planters, who saw the possible advantages of buddings twenty years ago.

From many hundreds of selected high-yielding trees clones were developed, but only a few of them have proved satisfactory. Many failed in their earliest tests to give the high yields expected from them. Others, although their early yields were satisfactory, developed serious secondary faults such as susceptibility to disease and mechanical injury, poor bark renewal, or other unforeseen defects. The result is that there are now only about 10 clones which can be confidently recommended for large-scale planting in Malaya. The original buddings of these clones have been tapped on systems similar to those in ordinary commercial use, for periods of 9 years or more and all of them have been tapped on renewed bark. Furthermore, young buddings from these clones, often loosely called " second generation buddings," have also been tapped for long enough to show that the high-yielding capacity of the original trees is passed on. Such clones are said to be " proved " although it would be more strictly correct to describe them as " approved," the name implying that they have successfully passed all reasonable tests and can be safely approved for large-scale planting. It is important to note that when a clone has been tested and shown to be satisfactory it is ready for use almost immediately. Multiplication of budwood is a simple operation and material can be produced quickly for planting on a large commercial scale.

Following this article are short notes on the 10 principal clones now recommended for use in Malaya. These clones have done well over long periods of testing, and for all of them the value of the original tests has been confirmed by additional records from " second generation buddings " in commercial areas on estates or in large field experiments.

Seedlings

At the same time that the first attempts to obtain high-yielding trees by means of budgrafting were made, there were other attempts to achieve the same object by carefully collecting and planting seeds taken only from selected high-yielding trees. It was generally found that areas planted with such selected seed gave yields about thirty per cent. higher than areas planted with unselected seed. This increase was rather disappointing in comparison with the

increases obtained with the best of the early clones. Improvement by the method of seed selection only was limited by the fact that although a thoroughly satisfactory mother could be selected there was at that time no means of ensuring that the pollen came from an equally satisfactory father.

Breeding of rubber trees was first studied by Dr. C. Heusser, at the A.V.R.O.S. Proefstation in Sumatra. He was able to show that by carefully controlled " crossing " (hand-pollination) between selected parent trees, families of seedlings could be obtained which were on the average as high-yielding as the buddings of good clones. Later work at the Proefstations in Java, at the Rubber Research Institute of Malaya, and by Dr. R. J. Chittenden (Prang Besar Rubber Co., Ltd.), confirmed and extended Heusser's work. The first breeding work was done on selected high-yielding seedling trees in ordinary plantations. Later work has been done on budded trees of proved clones. For this reason the term " clonal seed " has been generally adopted, as most of the high-yielding seedling families have been obtained from clones.

Clonal seeds may differ greatly in value according to their origin, and the principal categories are briefly described below.

Legitimate Seedlings

A " legitimate " seedling is a plant of which both parents are known. In Hevea a legitimate seedling cross can only be obtained with certainty by pollinating a female flower of one parent with pollen from a male flower of another. This must be done by hand. The operation is simple, but slow and laborious. The proportion of successes seldom exceeds 10 per cent. and is generally lower. Seedlings produced by hand-pollination between two parents form a legitimate seedling family. Most of the evidence of the value of clonal seedlings has been obtained from tests on legitimate seedling families.

Unfortunately, trees in a legitimate seedling family are not all of the same quality. It has been found by detailed study of some of the best legitimate families that there is often great variation within them. Also, undesirable characters which might not always show clearly in the parents, such as poor bark-renewal, and liability to disease or storm-damage might be passed on and appear more strongly in many of the offspring. Thus it is not enough to know that a

seed comes from a good mother-tree. It is still not enough if the male parent is also known to be satisfactory. For the reasons mentioned above even the most promising legitimate seedling family needs at least as long a period of careful " proving " as do the buddings of a clone, before the family can be recommended for planting on a large scale.

Legitimate families which have been tested for five years or more may be regarded as " proved families," in the same way that clones which have been so tested are regarded as " proved clones."

Before proved families of seedlings can be used on a large scale a method must be developed to produce large quantities of legitimate seed. Hand-pollination on a large scale is already being tried on a number of estates in Java, but it seems likely that the cost of seed produced by this means will be too high for general use.

Notes on some of the most promising legitimate families are given after the notes on clones following this article.

Illegitimate Seedlings

An " illegitimate " seedling is a plant of which only the female parent is known. Illegitimate clonal seed can be obtained in large quantities from many different sources. The value of seed from any source will depend first upon the value, as a seed parent, of the clone from which it is obtained and, secondly, on the value of the male parent which has supplied the pollen.

It is obvious that the seed may vary a great deal. The best seed is likely to be obtained from those parents which have been shown by careful breeding work to give high-yielding seedlings from many different " crosses."

"I.G. Seed." Clonal Seed from Isolated Gardens

Because of the difficulty of obtaining large quantities of legitimate clonal seed, attempts have been made to produce seed of similar value by planting isolated seed-gardens. These gardens are planted with two or more clones which have been shown, or are expected, to be valuable parents. Isolation is obtained by planting in jungle, or in coconut or oil palm areas, as remote as possible from other rubber areas. Seed produced in such gardens will be derived only from the clones planted in them. Although it will not be strictly legitimate seed its parentage will be known within

certain limits. If all the clones used in the garden have been proved to be good parents then it is likely that the seed produced will be of high quality.

Isolated garden seed can now be purchased in commercial quantities. It is generally bought on the assumption that because some of the clones in the gardens have been proved to be good parents the mixed seed from the garden will be of the same high quality as the few families which have been tested. This is a dangerous assumption, for the following reasons :—

(*a*) If more than two clones are present in the garden then more than one " cross " is possible. Unless all the possible crosses are of the same value some of the seed obtained will be relatively inferior. It is not possible to estimate the proportions of good and poor seed which will be obtained.

(*b*) Clones do not flower at the same time. It may happen that a valuable parent clone, owing to difference in flowering time, makes few crosses with its neighbours.

(*c*) In a garden containing several clones the possible number of families is usually far greater than the number which has actually been tested, so that a large proportion of the seed is of unknown value.

(*d*) Although self-pollination is believed to be rare, it is possible that certain parent clones, valuable in crosses, may also produce large numbers of " selfed " seed of poor quality.

Before the value of the produce of a seed garden can be regarded as proved it is necessary to plant representative collections of seed from such gardens and to test them in exactly the same way that new clones or small legitimate seedling families are tested. This is being done, and early results are very promising, but to obtain full proof of the value of " I-G Seed " will take just as long a time as the proving of a clone. Clonal seed of this origin should be used cautiously, and it is important that the degree of risk involved should be clearly understood.

Clonal Seeds from Budgrafted Areas on Estates

From large commercial plantings of buddings of the best proved clones large quantities of seed can now be obtained. Many of the clones used in commercial planting have been used with

success as parents of legitimate clonal seed families. Although budded areas of some of these good parent clones are not isolated they are often protected by other areas of high-yielding clones from contact with unselected seedling rubber. It is therefore possible in some cases that much of the illegitimate seed collected from areas of good mother clones may also have good clones as fathers, so that many of the seedlings may be as valuable as those of the legitimate families that have been so carefully bred and "proved." It is well worth while, therefore, to make careful collections of seed from known good parent clones in estate budgrafted areas and to plant small plots for future testing.

Clones which have been planted on many estates in this country, and whose legitimate or illegitimate seedlings have given promising results in tapping tests, are :—

Tjirandji 1 and 16,
Bodjong Datar 10,
Bogor Redjo 2 (B.R. 2),
Avros 33, 152, 157, 163 and 183,
Prang Besar 24, 25, 49 and 86,
Pilmoor B. 84 and A. 44,
Sabrang 24,
Sungei Reko 9,
Lunderston N.

To plant such material on large areas in preference to buddings of proved clones is certainly not advised, but the establishment of small trial plots by estates is strongly advocated. Estates having budgrafted areas of first-class clones can obtain large supplies of clonal seed for the mere cost of collection, and will be missing their opportunities if they do not in this way investigate the value of their own seed supplies.

Identification of Clonal Seeds

The mother parent of any "clonal" seed can be determined with reasonable certainty by an examination of its shape and characteristic markings, since these characters are constant for every clone. There is, however, no known method of determining the male or pollen parent from examination of the seed. Seeds from a budded tree of Tjirandji 1, for example, will always have the same characteristic shape and markings although the pollen parent may be any

other rubber tree. In mixed budded areas or in areas containing a number of clones in adjacent monoclone blocks, the seed should be collected and sorted. Seeds from those clones which have been proved to be good parents in legitimate crosses will be the first choice and these should be taken out for testing in separate plots. Plots of the general mixture of seeds, unsorted, should be planted for comparison, and buddings of a first-class proved clone should also be included in control plots.

Seedlings as Stocks for Budding

Until recently unselected seedlings, that is seedlings grown from seeds whose ancestry is quite unknown, have been used as stocks for budgrafting. Selection of stocks has been based almost entirely on vigour, the strong stocks having been shown to give the best early growth of young budgrafts made upon them. Recent work on the use of clonal seedlings as stocks has indicated that in one or two cases buddings made upon clonal seedling stocks have given slightly higher yields than buddings made on unselected seedlings. Where large supplies of clonal seed of mixed parentage are available at reasonable cost the use of such seedlings for stocks is recommended. Clonal seedlings of Avros 163 and Bodjong Datar 10 are of particular value for stocks.

New Clones from Clonal Seedlings

An important aspect of work on the breeding of high-yielding families of seedlings is that it greatly increases the opportunities for selection of outstanding individuals from which new clones can be made. From the best individual trees of the most promising families obtained by hand pollination many new clones have already been made. Many of these new clones have been tapped for short periods, and judging by these early tapping results some of them promise to be better than most of the older clones now in use.

The shortest period in which the yielding capacity of a clone can be conclusively proved is 10 years. This includes 5 years of continuous tapping. In addition, before a clone is recommended for general use it is of great advantage if its growth and yield in different situations and on different types of land can be observed. We have therefore introduced new clones on only a small scale, in experiments in different parts of the country. Until the early

satisfactory results are confirmed, estate managers are advised to be cautious about using new clones on the evidence of good yields during only a short period of test tapping.

The importance of this development of a new series of clones is particularly emphasised. By hand-pollination very high yielding families of seedlings have been produced. The best of the legitimate seedlings have been used immediately for making new clones. The proving of the legitimate seedling families and of the new clones made from them proceeds together. The " proofs " of each will be obtained about the same time. If satisfactory, the clone can then easily be multiplied extensively immediately, but if it were desired to plant the seedling families it would still be necessary to make seed by hand-pollination in the same slow, laborious way as at first.

The best of the new clones, made from the best individuals of a family, are likely to have higher average yields than the seedling family as a whole. A great advantage which a clone has over even the best seedling family is its uniformity, as opposed to the variability which is always found among seedlings. The trees of any one clone are all very nearly alike in every way, whereas the trees in a seedling family vary a great deal. Some types of variability, such as for example variability in tree-yields, can be overcome by planting a large number of trees and then thinning out selectively. Other types of variability, such as response to different tapping systems and susceptibility to disease, cannot be overcome in this way. For this reason the establishment and management of a monoclone budded area will always be easier, and probably cheaper, than is the case with any area of seedlings.

It seems highly probable therefore that the new clones made in this way from legitimate clonal seedlings will replace both the older clones and the seedling families derived from them. Taking a long view, the chief value of legitimate clonal seedlings is this probability that they will give rise to clones even better than those from which they themselves were produced.

Conclusions

The two methods of developing high-yielding planting material, by budgrafting and by breeding of high-yielding families of clonal

seedlings, are not opposed to each other. Properly handled, they help each other.

At the present time, although it has been shown that some legitimate seedling families give yields equal to those of the best proved clones, it is still not possible to produce enough of such " proved " legitimate seed for large-scale commercial planting.

Clonal seed from isolated gardens planted with good parent clones *may* be as good as legitimate seed from hand-pollinations, but this will have to be proved for each garden before its seed can be used without risk. Some illegitimate seeds from selected parent clones in commercial budded areas may also be as good as legitimate seed or seed from isolated gardens, but again proof is necessary. Meanwhile, budding is best.

MEETINGS, ETC.

RUBBER RESEARCH SCHEME (CEYLON)

Minutes of the forty-fifth meeting of the Rubber Research Board held in the Chamber of Commerce Building, Colombo, at 10 a.m. on Thursday, 27th October, 1938.

Present: Mr. E. Rodrigo, C.C.S. (in the chair), Mr. C. H. Collins, C.C.S.(Deputy Financial Secretary), Messrs. I. L. Cameron, L. M. M. Dias, L. B. de Mel, J. P., U.P.M., G. E. de Silva, M.S.C., L. P. Gapp, F. H. Griffith, M.S.C., Col. T. G. Jayewardene, V.D., Messrs. F. A. Obeyesekera, J. L. D. Peiris, C. A. Pereira, B. M. Selwyn, and R. A. Sharrocks.

Mr. T. E. H. O'Brien, Director, and Mr. R. K. S. Murray, Botanist and Mycologist, were also present by invitation.

Apologies for absence were received from Mr. R. P. Gaddum, J.P., U.P.M., Mr. R. C. Kannangara, M.S.C., and Mr. E. W. Whitelaw.

1. Minutes

(*a*) Draft minutes of the forty-fourth meeting which had been circulated to members were confirmed and signed by the Chairman.

(*b*) *Matters arising from minutes*—

(1) *Identification of Clones.*—The Chairman reported that the budding Mandor, whose services had been loaned by the Rubber Research Institute of Malaya, arrived on 11th September, 1938, accompanied by a Ceylonese Laboratory Assistant. He was now engaged in identifying clones on estates. In reply to a question the Director stated that he was endeavouring to arrange for the period of the officers' visit to be extended.

2. Experimental Committee

Recommendations made at a meeting held on October 4th, 1938, were considered :—

(*a*) *Visiting Agent's Report.*—The report of an inspection of the estates by the acting Visiting Agent, Mr. D. T. Angus, was considered and adopted.

(*b*) *Oidium Leaf Disease.*—The Chairman said that the general attitude of the Board in regard to the control of Oidium had been defined at the last Board meeting. Proposals for future research work had been considered by the Experi-

mental Committee and were now before the meeting for discussion. A letter had recently been received from the Secretary of the Planters' Association of Ceylon forwarding the following resolution passed at the Matale Planters' Association : " That the Rubber Research Scheme be asked to undertake further research on Oidium and its control." The proposals should be considered in relation to that resolution.

Mr. Murray then read a memorandum summarising the work already carried out by the Research Scheme on the control of Oidium, and replied to various questions. After general discussion it was decided to adopt the proposals for future work, subject to the necessary estate co-operation being forthcoming. The Chairman stated that a reply would be sent to the Planters' Association outlining the work to be undertaken.

(*c*) *Trials of Planting Material on Estates.*—It was agreed that arrangements should be made for test plots of one acre each of promising new clones and their illegitimate seedlings to be established on estates in different districts. The following conditions were approved for the trials :—

(1) Planting material to be supplied free by the Research Scheme.

(2) Research Officers' recommendations for manuring and other cultivation measures to be accepted by the estates concerned.

(3) Research Officers to have facilities for making observations during the development and tapping of the trees.

(*d*) *Tapping Trials.*—Approval was given to proposals for the comparison of various tapping systems for budded trees in co-operation with estates, with a view to ascertaining the system best suited to each particular clone.

(*e*) *Survey of Replanted Area 2A.*—A vote of Rs. 175/- was passed to cover the cost of a detailed survey of this area, as recommended by the Committee.

3. Smallholdings Committee

Recommendations made at a meeting held on 27th August, 1938, were considered :—

(*a*) *Conditions of Service of Rubber Instructors.*—It was agreed that the conditions should be revised on lines recommended by the Committee.

(*b*) *Issue of Posters.*—The general principle of issue of posters depicting the work of the Smallholdings Department was approved.

A poster was submitted for inspection and it was agreed that it would be suitable for issue in a modified form. The Director was asked to obtain alternative estimates for printing the poster in colour.

(*c*) *Instructional Nurseries.*—The recommendation was approved that all budding should be done with material of approved clones except in the case of plants used for practising budding and that suitable budwood should be supplied from Nivitigalakele. A decision regarding the sale of the plants was postponed.

(*d*) *Marketing Facilities for Village Rubber.*—In the course of discussion it was made clear that the Rubber Research Board is not directly concerned with

marketing problems, and that their action should be confined to drawing the attention of the proper authorities to the need for the provision of improved facilities. It was agreed that the Commissioner for the Development of Agricultural Marketing should be asked to consider the appointment of " approved dealers " when market conditions are suitable.

4. Accounts

Estimates of Income and Expenditure for 1939.—Draft estimates which had been circulated to members were considered. In reply to a question the Director said the estimate of income from cess collections was based on a release of 50 per cent. of next year's exportable quota (106,000 tons). He estimated that world consumption of rubber during the next restriction period would be about 1,000,000 tons per year. On that basis the Scheme would be in a satisfactory financial position during the next five years.

After general discussion and minor alterations the estimates were approved as follows :—

Income	Rs. 177,719
Expenditure, Revenue	,, 195,382
Expenditure, Capital	,, 11,742

5. Staff

Reported the appointment of Mr. H. B. Wijesundera as Rubber Instructor, Ruanwella, with effect from 1st October, 1938.

6. New Planting

Reported that application had been made to the Rubber Controller for permission to plant 20 acres of land at Nivitigalakele in 1939 and 1940.

The meeting terminated with votes of thanks to the chair, and to the Chamber of Commerce for the use of the Committee Room.

Research Laboratories,
Dartonfield,
Agalawatta,
18th *November*, 1938.

RUBBER RESEARCH SCHEME (CEYLON)

Minutes of the forty-sixth meeting of the Rubber Research Board held in the Committee Room of the Ceylon Chamber of Commerce, Colombo, at 2.30 p.m. on Tuesday, January 17th, 1939.

Present:—Mr. F. P. Jepson (in the chair), Messrs. C. H. Collins, C.C.S. (Deputy Financial Secretary), I. L. Cameron, L. M. M. Dias, L. B. de Mel, J.P., U.P.M., G. E. de Silva, M.S.C., L. P. Gapp, F. H. Griffith, M.S.C., Col. T. G. Jayawardene, V.D., Messrs. R. C. Kannangara, M.S.C., J. C. Kelly, F. A. Obeyesekere, J. L. D. Peiris, B. M. Selwyn, E. W. Whitelaw.

Mr. T. E. H. O'Brien, Director, was present by invitation.

Before proceeding with the agenda the Chairman said he wished to report that he had assumed duties as Chairman of the Board with effect from December 1st, 1938, while acting as Director of Agriculture in the absence of Mr. E. Rodrigo who was on leave. Mr. Rodrigo was expected to resume duties on March 1st, 1939.

Reported that messages of good wishes for 1939 had been received from the Rubber Growers' Association, the Rubber Research Institute of Malaya, and the Ceylon Association in London.

1. Minutes

Draft minutes of the forty-fifth meeting which had been circulated to members were confirmed and signed by the Chairman.

2. Board

Reported the following changes in the membership of the Board since the last meeting :—

(1) Mr. E. W. Whitelaw's three year period of office had expired on 14th December, 1938, and he had been re-nominated by the Rubber Growers' Association to serve for a further period of three years from that date.

(2) Mr. R. P. Gaddum had resigned with effect from 10th January, 1939.

(3) Mr. J. C. Kelly had resumed membership on return to the Island with effect from 6th December, 1938, relieving Mr. R. A. Sharrocks who had acted for him.

Votes of thanks were passed for the services of Messrs. Gaddum and Sharrocks.

4. Accounts

(*a*) *Statement of Receipts and Payments of the Board* for the quarter ended 30th September, 1938, was approved.

(*b*) *Dartonfield and Nivitigalakele Accounts* for July, August, September and October, 1938, were tabled.

(*c*) *Depreciation Rates.*—Reported that, as decided at the last meeting, the advice of the Treasury representative had been sought regarding amendment of the allowances to be made for depreciation of fixed assets. After consideration of the recommendations made by the Treasury representative the following rates were approved :—

	New Rate Per cent.	*Old Rate* Per cent.
Buildings	3½	4
Plant and Machinery	7½	7½
Lab. Equipment	7½	25
Electric Accumulators	20	7½

(*d*) *Fixed Deposit.*—Reported that a fixed deposit of Rs. 50,000/- had been renewed for a further period of 12 months from 31st December, 1938.

(*e*) *Investment of Funds.*—The following Committee was appointed to consider the question of future investment of funds and report to the Board :—

The Chairman of the Board.
The Treasury Representative.
Mr. J. C. Kelly.
Col. T. G. Jayewardene, V.D.

(*f*) *Employees' Provident Fund.*—Consideration was given to a proposal to modify the rules of the employees' provident fund so that all monthly-paid employees would become eligible for membership. After discussion it was decided to refer the matter to the Committee appointed to consider the investment of funds.

5. Staff

(*a*) Reported that Dr. L. A. Whelan, M.Sc. (N.Z.), Ph.D. (Aberdeen), A.I.C. the newly appointed Soil Chemist, had arrived in Ceylon on October 31st, 1938.

(*b*) Reported that Mr. M. W. Philpott, Chemist, had returned from leave on November 14th.

(*c*) Reported that Mr. P. Tharmalingam, B.Sc., had been appointed Analyst in the Soils Department, with effect from January 3rd, 1939, in accordance with the decision reached by circulation of papers.

6. Experimental Committee

Recommendations made at a meeting held on December 19th, 1938—

(*a*) *Over-expenditure of Votes.*—Supplementary votes of Rs. 87/- and Rs. 40/- were approved to meet over-expenditure in replanted areas No. 2a and 3, at Dartonfield Estate.

(*b*) *Training in Estate Works.*—Arising from an application for training in general field works consideration was given to the possibility of facilities being given for such training at Dartonfield and Nivitigalakele. After discussion the Director was asked to submit proposals to the Experimental Committee for consideration.

(*c*) *Identification of Clones.*—Reported that the Chinese Mandor, who had been engaged in the identification of clones on estates, would return to Malaya on February 9th. It was agreed that the services of Research Scheme officers should be made available for this work in future, subject to their travelling expenses being refunded by the estates concerned.

7. Technical Officers' Progress Reports for the Quarter ended 30th September, 1938

were adopted without comment.

A copy of notes prepared by Mr. Philpott dealing with visits to factories, etc., and interviews while on leave in England was tabled. It was agreed that one copy of the notes be circulated to members.

8. London Advisory Committee

Minutes of meetings of the London Advisory Committee for Rubber Research (Ceylon and Malaya) and the Technical Sub-Committee held on 30th September, and 14th October, 1938, respectively were adopted.

9. New Rubber Planting

Reported that Government had adopted a scheme for giving advice and assistance to persons of the middle and peasant classes in the planting of Rubber under the terms of the Rubber New Planting Ordinance No. 38 of 1938. An officer of the Department of Agriculture had been seconded for duties as Chief Advisory Officer in the Land Commissioner's Department and would have a staff of about 50 instructors.

As part of the arrangements the Research Scheme had been requested to prepare a manual of instruction in new planting. The work had been undertaken by Mr. R. K. S. Murray who had completed the draft of Part I, dealing with first-year planting operations.

It was also desired by Government that the instructors should be trained at Nivitigalakele. The time available was very short and it was proposed that the instructors should be taken in four batches for a period of two weeks' training in contour lining, cutting of drains, etc. The Smallholdings Propaganda Officer would be in charge of the work. The proposal was approved.

10. Rubber Conferences

Reported that the Rubber Conference held at Tebuwana, on November 25th, 1938, under the auspices of the Planters' Association of Ceylon and with the co-operation of the Research Scheme, had been very successful. It was agreed that future conferences should be organised on similar lines and that the Research Scheme would co-operate fully with the Planters' Association in the matter.

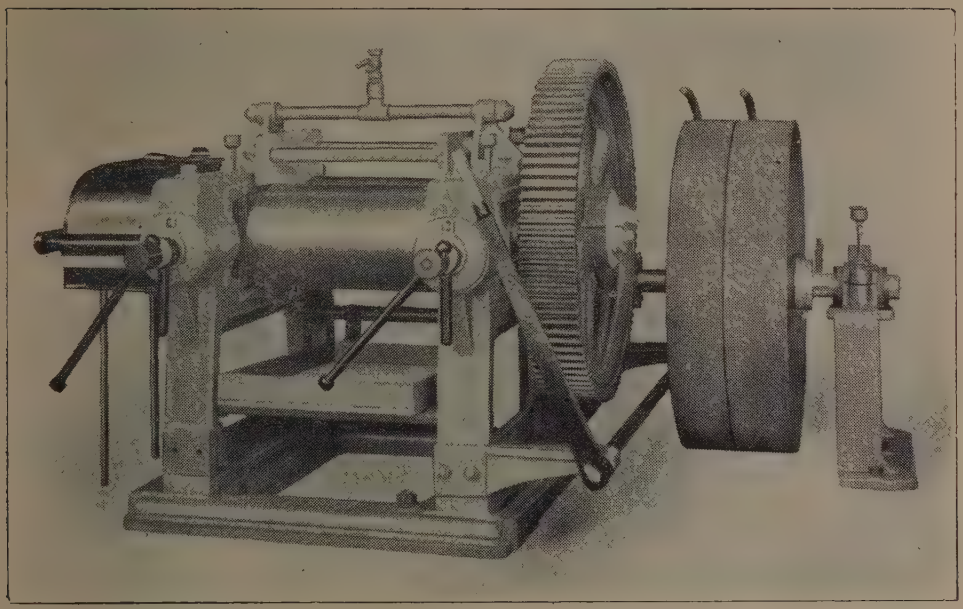
The meeting terminated with a vote of thanks to the Chamber of Commerce for the use of the Committee Room.

Research Laboratories,
Dartonfield,
Agalawatta,
2nd February, 1939.

WALKERS

WASHING, CREPING AND SHEETING

RUBBER MILL



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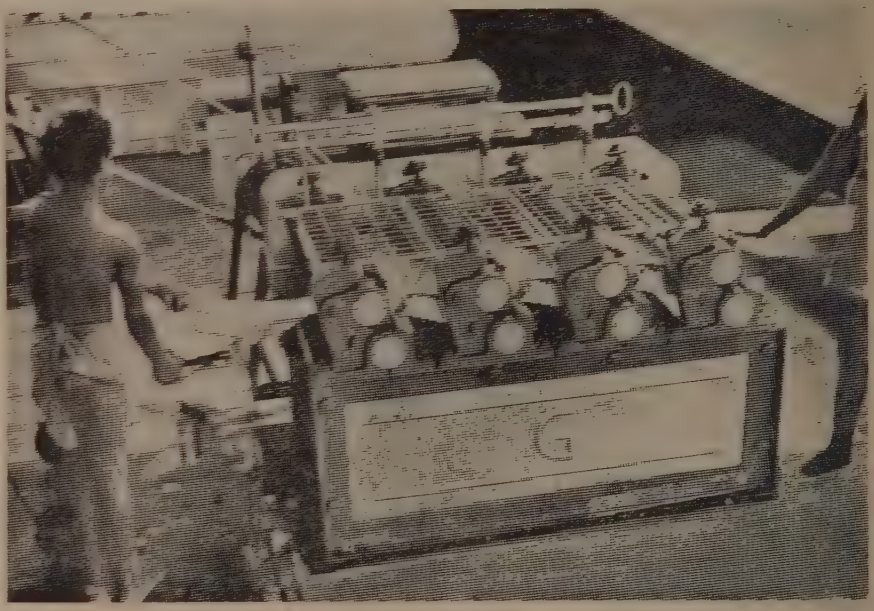

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Photographed 29-8-38.
Height from bud union:—8 feet 3½ inches
Girth (3 feet from ground level):—2½inches

Without POTASH

With POTASH

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Photographed 29-8-38.
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